

A Swiss computer typesetting system

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GSA are the initials of a computer typesetting system and stand for Güttinger Satz Automation, the equipment being a development and manufacture of Güttinger AG, Niederteufen, Switzerland. The overall system outputs justified punched tape in TTS code for controlling linecasting machines, and in the 31-channel co-ordinate code for operating Monotype and Monophoto machines. Three of the six units constituting the GSA System are applicable to the production of both kinds of tape, namely the input perforator, correction unit, and hyphenation unit. Having been processed by these units, the typesetting data passes either to a line justifying computer for output as a TTS tape or to a reader-adaptor and Monotron computer for output as a Monotype or Monophoto spool.

Punched paper tape represents the common machine language for linking up all the special-purpose units of the system. In other words, a punched tape can be fed for processing into a unit and a punched tape will be output by that unit. Alternatively, the connections between units can be by cable in which case the data is transmitted from one to another as electrical impulses.

One of the most interesting features of the GSA system is its building block conception which allows a printer to install only those units he can afford at any given time or those having particular relevance to his work requirements. Thus, a phased programme of development can be conceived to suit most budgets and an equipment configuration tailored to suit most needs.

Input perforators

GSA input perforators are based on an IBM electric typewriter mounted on a desk. Accommodated in the top drawer of the desk is an Addo punch. The electronic control circuitry for punching and for logic printing is housed in a console near by. Augmenting the main keyboard is a control shoe that fits along the bottom and to the right of the typewriter. There are three kinds of GSA control shoes: one for line composition, another for Monotype output, and a third for direct on-line operation of the Monotron computer (as opposed to automatic tape operation via the reader-adaptor). On all of these control shoes are key-buttons for extra characters and for typesetting functions. Slight differences exist between each of the three shoes as necessitated by peculiarities of the actual typesetting machine. Included among the typesetting function keys are those for alphabet selection (ie roman, italic, and bold; or upper rail and lower rail), erasure of invalid codes, word correction, automatic quadding, fixed spaces, and so on.

On GSA input perforators either of two code structures can be punched. For the eventual operation of linecasting machines, a 6-channel tape punched in standard TTS language is produced; whereas for Monotype machine output a 7-channel tape is prepared. On the 7-level tape, the basic character information conforms to TTS coding, but the seventh channel is used for the extra characters and commands available on Monotype machines. Both tapes are $\frac{7}{8}$ " wide, thereby permitting the use of a standard tape punch, unwinder, and rewinder. Information holes have a diameter of .071" and the distance between the centres of two rows of codes is .1". Using four precedence codes for Monotype output, the signalling potential of the perforator extends to 456 characters.

Produced simultaneously with the unjustified punched tape is a hard copy which offers cryptic representation of functions and characters additional to the 88 on the typing head. For example, a ligature will appear as f+i; while a quad-left signal shows as (=). Logic printing of this sort means that the hard copy can provide a fairly sound basis for the subsequent tape merging of house corrections at least and (authors and publishers willing), perhaps for author's corrections too in the future.

Correction unit

Preparation for the tape merging process undertaken by the correction unit begins with the keyboarding of the original tape. All the operator has to do is to tap the number of the first line and an activate key on a correction control box connected to the input perforator, so causing the number to be struck on the hard copy and a recognition code to be punched in the tape. Thereafter all succeeding lines are automatically numbered down the left-hand side of the hard copy and the corresponding identification codes inserted on the tape with each carriage return on the keyboard.

Having been checked and marked by a proofreader, the original hard copy returns to the keyboard operator for the punching of a correction tape. According to the seriousness of the mistakes, the corrections will concern entire lines (that is in hard copy terms) or odd words. Deletions, substitutions, and insertions can all be effected, the lines and words being addressed directly and with a reasonable economy of keystroking. Four function keystrokes are necessary for making line corrections, while word corrections demand a fifth function keystroke.

Like other tape mergers, the correction unit incorporates two tape readers for decoding the original and correction tapes

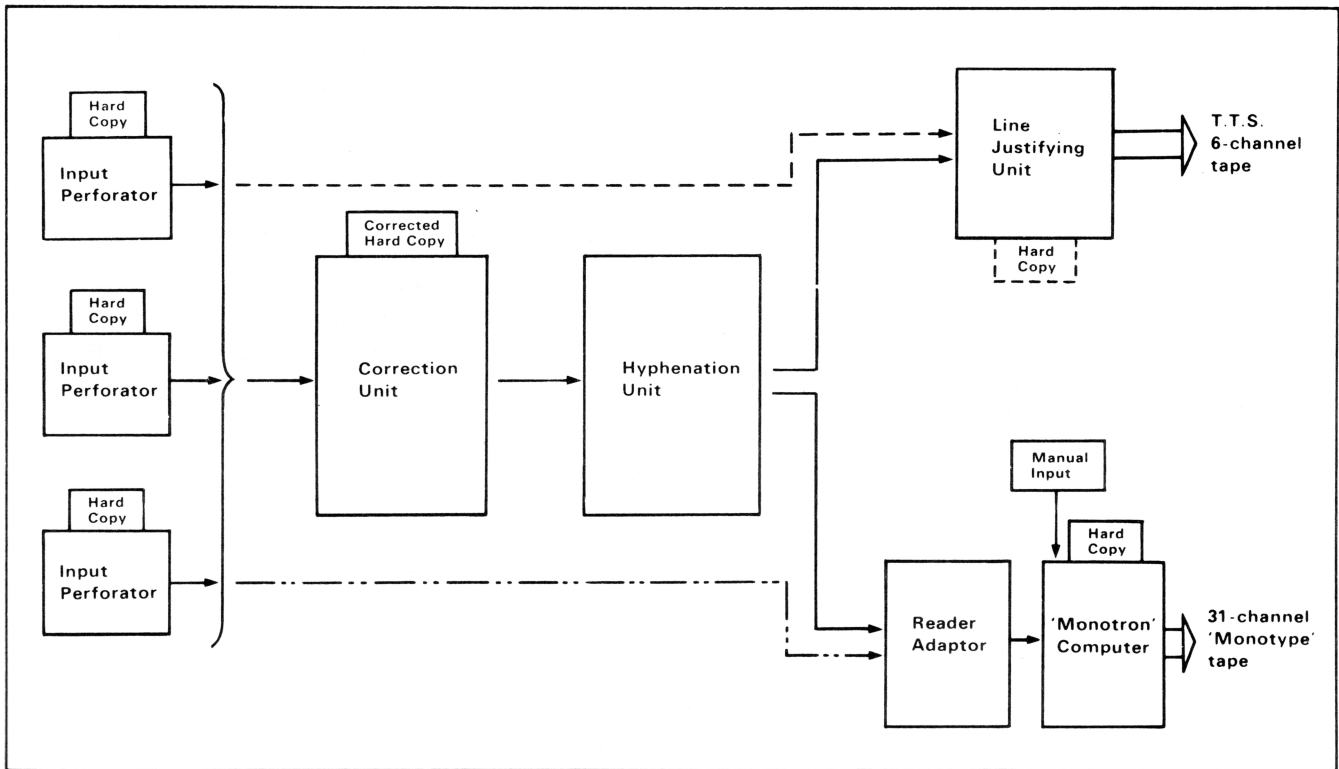


Fig 1 Diagrammatic representation of the GSA System

respectively. Digitronic photo-electric readers are used and these operate at the rate of 130 codes per second.

It is the correction tape which governs the merging process, the logic of the system being quite straightforward. At the start of merging, the correction tape enters its reader first to have the three digits of the initial line number deciphered serially and stored in memory. Next the original tape advances into its reader and if the identification code of the first line does not coincide with the one recognized by the correction reader, the original tape will continue its pass through the equipment and output data to the punch or cable and/or printing unit. Thereafter, a comparison between the memorized correction address code and a succession of original line identification codes takes place until the addresses on both tapes eventually coincide. Having reached coincidence, the correction tape advances further into its reader to define the nature of the change, the absence of a fourth serial digit or the presence of an add signal denoting a line correction and the occurrence of a fourth serial digit indicating a word correction.

Three forms of output are obtainable from the correction unit, all containing merged corrections: a punched tape (6 or 7-level); a printout; and a cable connection to the next unit. Two of these are available simultaneously.

Coincidence of numbering on the input and output tapes can be preserved if required, irrespective of the deletions and insertions made. Furthermore, unnumbered tapes, coming from keyboards other than the GSA input perforator, can be processed through the system. Such an input would mean a preliminary pass through the merger for securing a numbered output tape and a

correspondingly numbered printout, thereby preparing the way for punching a correction tape and a second pass through the correction unit for merging.

Justification

Justification of matter for output as a 6-channel TTS tape is effected in a line justifying computer, a solid-state fully transistorized unit. In this unit the brass widths for two magazines of characters are held in a magnetic core store as run-in from program or encoding tapes. Justification logic follows the established pattern of calculating the accumulated widths of the input characters and every time a variable space at the end of a word is signalled, the sum of the assembled line length is compared with the overall measure. Ultimately the accumulated character-widths will exceed that of the measure, so causing the computer to back track to the last space (coming within the span of the measure) and enter the justification program. Four steps constitute the justification program: spaceband expansion alone; spaceband expansion plus a thin space; spaceband expansion plus an en-quad; and two spacebands separated by an en-quad. Should all of these routines fail to justify a line, a hyphenation decision will be sought from a monitor by providing a printout of the fall-off word on which the hyphenable portion appears in black with the flanking letters in red. Hyphenation decisions are entered into the computer by means of push buttons. Where additional orientation for hyphenation purposes is required by the monitor, the matter immediately preceding or succeeding the fall-off word can be printed-out. In installations having the hyphenation unit, the four basic justification steps remain unchanged, but after each one the computer will search (when

required) for a previously inserted hyphenation mark. These justification priorities are not invariable and by means of switches their order can be re-arranged to suit individual needs. Facilities for handling composition with ragged right-hand margins, sometimes curiously called unjustified setting, are provided by the computer which will substitute fixed spaces for all variables and implement the automatic quad routine at the ends of lines.

Two sets of variable decimal switches are incorporated on the front panel of the unit for pre-selecting any measure up to 100 ems in 1-point increments. For newspaper production, the two sets of switches can be adjusted to double-column and single-column measures and may be correlated respectively to two Teletype output punches. Either of the pre-determined measures can be brought into operation by monitored push-button selection.

Four indentation routines are wired into the computer to give: all lines full-out to the measure; indentation at the commencement of paragraphs; hanging indent; and all lines indented. Amount of indentation can be selected on variable switches in multiples of ems, ens, and thins. Furthermore, an indent on the input tape can be repeated through to the end of a paragraph.

Keyboard shorthand is a standard feature of the system and can involve up to 512 characters, though the extent to which this facility can be usefully applied warrants careful investigation. Seemingly, a few words of high frequency would appear to be the limit, except perhaps for the occasional local place name that crops up consistently in provincial newspapers.

Justification for Monotype output is achieved by passing the data through a reader-adaptor and Monotron computer. These units are permanently linked together by multi-core cable and function as a single unit. Apart from converting the seven-level input to Monotron language, the reader-adaptor has other important uses. Built into the front panel are variable switches for determining the spacing parameters to be implemented during the first phase of a series of justification priorities, the switches being adjusted to give lower wedge readings (eg 2/8) and upper wedge readings (eg 8/10). Justification logic in the reader-adaptor and Monotron is the same as that obtaining in the line justifying computer, but naturally the details differ. As an initial step, the computer will attempt to justify a line by increasing the word spaces within the limits allowed by the switch-selected parameters. Should this fail, the second justification routine automatically extends the upper limit to wedge increments of 15/15. As a third routine (one rarely used on book measures), the possibility of adding positive spaces to variables is explored to effect justification. If a successful conclusion is not reached, the fall-off word is printed-out for a monitored hyphenation decision in the manner already described in relation to TTS working. Where automatic hyphenation is employed, the three justification steps would each be succeeded by a search for a hyphenation signal before embarking on the next routine. Unjustified composition is catered for by the reader-adaptor and Monotron, together with four indentation alternatives and ligature formation.

At the Monotron computer (coupled to the reader-adaptor), the



Fig 2 Keyboard of the GSA Input Perforator fitted with a Monotype Composhoe. To the left of the keyboard is the correction control box for producing correction address codes

measure and set size of the type are chosen on variable decimal switches, the typeface being determined at the same time by a wired program in the form of a character plug board. Programming for tabular matter up to a maximum of 35 columns is achieved by way of a punched card and companion reader. On the card, the cumulative column widths are punched in a binary code. Automatic quadding and leading signals on the input tape cause the Monotron computer to insert single and double justifications on the 31-channel output tape as appropriate.

Monotron keyboard

It is possible to operate the Monotron computer direct from an on-line keyboard away from the overall system, a concept that is practised on the TTS side of the business by the Di/An computer keyboard. When operated from an on-line keyboard, the Monotron is performing a function exactly parallel to that of a conventional Monotype keyboard. For specialized applications, such as tabular work, this apparently restricted use of the Monotron could be interesting, as evidenced by production figures in Switzerland where the 35-column punched card reader allied to automatic justification has allegedly increased keyboard production by 200 per cent, and in some cases by 300 per cent. On straight matter, the volume of output has also increased quite markedly, a figure of around 60 per cent being quoted: the latter being a little difficult to credit. Both audible and visual warnings are given to the operator of the imminence of a line end.

When operated from an on-line keyboard, the Monotron computer has several routines which can be summoned from the front panel by means of push buttons, such as unit adding, justified letterspacing, ligature training, automatic leading, line cancelling, paging, two-colour working, etc.

Equipment configurations

Like all other computer systems, the speed or output of the equipment is governed by the peripherals employed, such as

printers and tape punches. In relation to the GSA system the ensuing speeds need to be considered: narrow-tape Teletype punch (ie 6- or 7-level) 110 cps (or about 300,000 eph), 31-channel Datek punch 20 cps (72,000 eph), Digitronic tape reader 130 cps (400,000 eph), and IBM typewriter printout 15 cps (50,000 eph). Obviously any equipment configuration will be dependent upon the rate of keyboard input and the kinds of output required.

If Monotype composition is considered first, the limiting factors will be the typewriter printout and the 31-channel punch. If a punched tape only is wanted from the Monotron computer, the production speed will be 72,000 ens per hour which pre-supposes the installation of half a dozen input perforators (assuming a keyboard rate of 12,000 unjustified ens per hour) for feeding around six filmsetters *or* nine casters. However, should a printout and a punched tape be simultaneously required

from the Monotron, cursory examination suggests that five input perforators should suffice to sustain an output of 50,000 ens per hour for feeding five filmsetters *or* seven casters. Both of these schemes incorporate automatic hyphenation.

Similarly figures can be drawn up for TTS working, to serve at least as a starting point until more reliable production statistics become available. Should a printout as well as a TTS tape be required from the line justifying computer, the potential output will still be 50,000 ens per hour. Probably five input perforators will fill this capacity and the output will keep around three Elektrons or Monarchs occupied. If a TTS tape only is wanted from the computer, the potential speed rises to about 300,000 ens per hour or 10,000 news lines: assuming automatic hyphenation. This figure would drop to 5,000 news lines or 150,000 ens per hour with monitored hyphenation occurring every sixth or seventh line on a news measure.